

AF/2853

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Hideo SAMURA

Serial No.: 09/343,092

Filed: June 30, 1999



: Response Under 37 CFR 1.116 - Expedited Procedure

: Group Art Unit: 2853

: Examiner: C. Dickens

For: HEAD FOR INK-JET PRINTER HAVING PIEZOELECTRIC ELEMENTS PROVIDED FOR EACH INK NOZZLE (AS AMENDED)

Box AF
THE COMMISSIONER FOR PATENTS AND TRADEMARKS
Washington, DC 20231

Dear Sir:

Transmitted herewith is an Amendment in the above identified application.

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☐

No additional fee is required.

Small entity status of this application under 37 CFR 1.9 and 1.27 has been established by a verified statement previously submitted.

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☒

A verified statement to establish small entity status under 37 CFR 1.9 and 1.27 is enclosed.

Also attached: Petition for Extension of Time

The fee has been calculated as shown below:

	NO. OF CLAIMS	HIGHEST PREVIOUSLY PAID FOR	EXTRA CLAIMS	RATE	FEE
Total Claims	11	20	0	\$9.00 =	\$0.00
Independent Claims	3	3	0	\$40.00 =	\$0.00
Multiple claims newly presented					\$0.00
Fee for extension of time					\$55.00
					\$0.00
Total of Above Calculations					\$55.00

☒ Please charge my Deposit Account No. 500417 in the amount of \$55.00. An additional copy of this transmittal sheet is submitted herewith.

☒ The Commissioner is hereby authorized to charge payment of any fees associated with this communication or credit any overpayment, to Deposit Account No. 500417, including any filing fees under 37 CFR 1.16 for presentation of extra claims and any patent application processing fees under 37 CFR 1.17.

Respectfully submitted,

MCDERMOTT, WILL & EMERY

William D. Pegg
Registration No. 42,988

600 13th Street, N.W.
Washington, DC 20005-3096
(202) 756-8000 WDP:lnm
Date: April 30, 2001
Facsimile: (202) 756-8087

TECHNOLOGY CENTER 2800

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Docket No.: 50059-04

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

: **RESPONSE UNDER 37 CFR 1.116**

Hideo SAMURA

: **EXPEDITED PROCEDURE**

Serial No.: 09/343,092 ✓

: Group Art Unit: 2853

Filed: June 30, 1999

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For: HEAD FOR INK-JET PRINTER HAVING PIEZOELECTRIC ELEMENTS PROVIDED
FOR EACH INK NOZZLE (AS AMENDED)

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RESPONSE UNDER 37 CFR 1.116

Box AF
Commissioner for Patents
Washington, DC 20231

Sir:

In response to the Final Office Action dated December 28, 2000, please reconsider the rejections posed therein in view of the following remarks:

REMARKS

Claims 1 and 3-12 are pending in this application.

The Office Action alleges claims 3 and 8-10 are directed to an invention that is independent or distinct from the invention originally claimed. Specifically, the Office Action alleges that the ink jet head of claims 3 and 8-10 can be made by another materially different process, such as etching, drilling, or punching. Applicant respectfully traverses this restriction requirement. However, claim 3 relates to a method for manufacturing a head for an ink-jet printer and explicitly recites "forming said piezoelectric element . . . by applying a fine

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patterning . . . through optical fabrication" which, as evident in the specification (see page 9, lines 1-23) does not relate to "etching, drilling, or punching", as alleged. Moreover, as stated in Applicant's disclosure, under the conventional technology, there is a limit in applying such machining or processing to an ink head sufficient to achieve the very fine ink nozzle and ink passage size and pitch as claimed (see, e.g., page 3, lines 1-5 of Applicant's specification). Withdrawal of this restriction requirement is therefore requested.

Claims 1, 4-7, 11 and 12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over **Shimada** (U.S. Patent No. 5,825,121) in view of **Usui** (U.S. Patent No. 6,134,761) and **JP 10-86365**.

The Examiner continues to allege **Shimada** provides ink nozzles 210, ink passages 204, ink chambers 203, and piezoelectric elements 208 and alleges **JP 10-86365** provides a piezoelectric element comprising a thin film of a ferroelectric substance. The Examiner acknowledges **Shimada** does not provide specific dimensions or relative dimensions of the ink nozzles, passages, or chambers, and does not provide for a plurality of laminated silicon substrates. **Usui** is relied upon to make up for this deficiency and is alleged to provide ink passages 10 that are "fine" in relation to the ink chambers 4 and tapered ink nozzles 28 are "fine" in relation to the ink passages 10. The Examiner also alleges, equating ceramic substrates to silicon substrates, that **Usui** provide lamination of plural ceramic substrates for the purpose of increasing the mechanical strength of the flow path forming member in an ink jet head (see col. 7, line 63 to col. 8, line 46).

Claim 1 relates to a head for an ink-jet printer including a silicon substrate on which a plurality of ink nozzles and a plurality of ink passages, each communicating separately to each of the ink nozzles, processed finely using a plasma etching method. An inorganic substrate joined

with the silicon substrate is provided with ink chambers, each communicating separately to each of the ink passages. A piezoelectric element of ferroelectric substance is provided to separately change a capacity of each of the ink chambers to jet ink from the ink nozzles through the ink chambers. The ink passages are fine as compared with the ink chambers and the ink nozzles are fine as compared with the ink passages. This construction, employing silicon as a material of the substrate on which the ink nozzles and ink passages are both formed, permits formation of a high nozzle density structure within a small head (i.e., a fine spacing between nozzles) to permit a high print quality.

Usui is alleged to teach or suggest “the lamination of plural ceramic substrates, i.e., silicon, (7, 8, 11)(col. 7, lines 63-67 - col. 8, lines 1-46)”. However, as known to those skilled in the art, ceramic does not include silicon. **Usui** discloses a ceramic ink jet head, wherein the elastic board 2 is ceramic and the pressure-generating-chamber forming member 7 is ceramic (see col. 7, lines 64-67). More precisely, **Usui** teaches that both the elastic board 2 and the pressure-generating-chamber forming member 7 are made from zirconium oxide (ZrO_2), also known as zirconia (see col. 3, lines 25-29). Further, the spacer 7, lid member 8, and flow path regulating board are all made of zirconia (green sheets) (see, e.g., col. 3, line 36 to col. 4, line 18), which are stacked and sintered to form a flow path forming member (see col. 4, lines 14-18). **Usui** explicitly provide that “the green sheets which are used to form the flow path forming member are substantially equal in composition to one another, and are sintered at the same time” (col. 8, lines 34-37).

Usui also provide that nozzle plate 27 is made of stainless steel. Specifically, **Usui** asserts that “Reference numeral 27 designates a nozzle plate made of a metal such as a stainless steel plate which shows a high corrosion resistance against ink. The nozzle plate 27 has the

aforementioned nozzle openings 28 in correspondence to the pressure generating chambers 4” (see col. 4, lines 19-21; see also Figures 1 and 2). Similarly, **Usui** recite that “nozzle plate 27 is prepared by forming the nozzles openings 28 in a metal plate such as a stainless steel plate which is corrosion-resistant against ink” (col. 5, lines 57-59). **Usui** also state “the nozzle plate 27 is prepared by forming the nozzle openings 28 in a metal plate such as a stainless steel plate” (see col. 7, lines 1-3).

Thus, **Usui** does not teach or suggest “a silicon substrate on which a plurality of ink nozzles and a plurality of ink passages each communicating separately to each of the ink nozzles are processed finely using a plasma etching method”, as required by rejected claims 1, 4-7, 11 and 12. **Shimada** and **JP 10-86365** similarly do not teach or suggest this feature of the invention. **Shimada** specifically calls for a single-crystalline Si substrate 201 connected to a glass substrate 202 on which ink channels 204 and an ink fountain 205 are provided (see col. 5, lines 8-10). **Shimada** contains absolutely no mention or suggestion of “a silicon substrate on which a plurality of ink nozzles and a plurality of ink passages each communicating separately to each of the ink nozzles are processed finely using a plasma etching method”, as claimed, and **JP 10-86365** is silent as to this aspect of the invention.

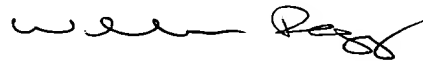
Therefore, the applied combination of **Shimada**, **JP 10-86365**, and **Usui** does not teach or suggest each and every aspect of the claimed invention. Reconsideration and withdrawal of the 35 U.S.C. § 103(a) rejection of claims 1, 4-7, 11 and 12 are therefore requested.

If the Examiner has any questions regarding this Amendment or application, the Examiner is kindly requested to contact the undersigned at the exchange listed below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

MCDERMOTT, WILL & EMERY



William D. Pegg
Registration No. 42,988

600 13th Street, N.W.
Washington, DC 20005-3096
(202) 756-8000 WDP:lnm
Date: April 30, 2001 (Monday)
Facsimile: (202) 756-8087